CHAPTER 1 - OVERVIEW

INTRODUCTION

This report documents the results of the Year 2003 Model Validation process for SCAG's Regional Transportation Model. Model validation is defined as the process by which base year model results are compared to "known" sources of data such as traffic counts and transit ridership data. SCAG performs a validation of its transportation model at the beginning of each planning cycle for the Southern California Region. A planning cycle is typically three years, corresponding to the update of the Regional Transportation Plan. The "base year" for the current planning period is Year 2003, and Year 2035 is the "forecast year". Model validation is a regular and essential modeling process that supports development of the Regional Transportation Plan (RTP), the Regional Transportation Improvement Program (RTIP), and the Air Quality Management Plan (AQMP).

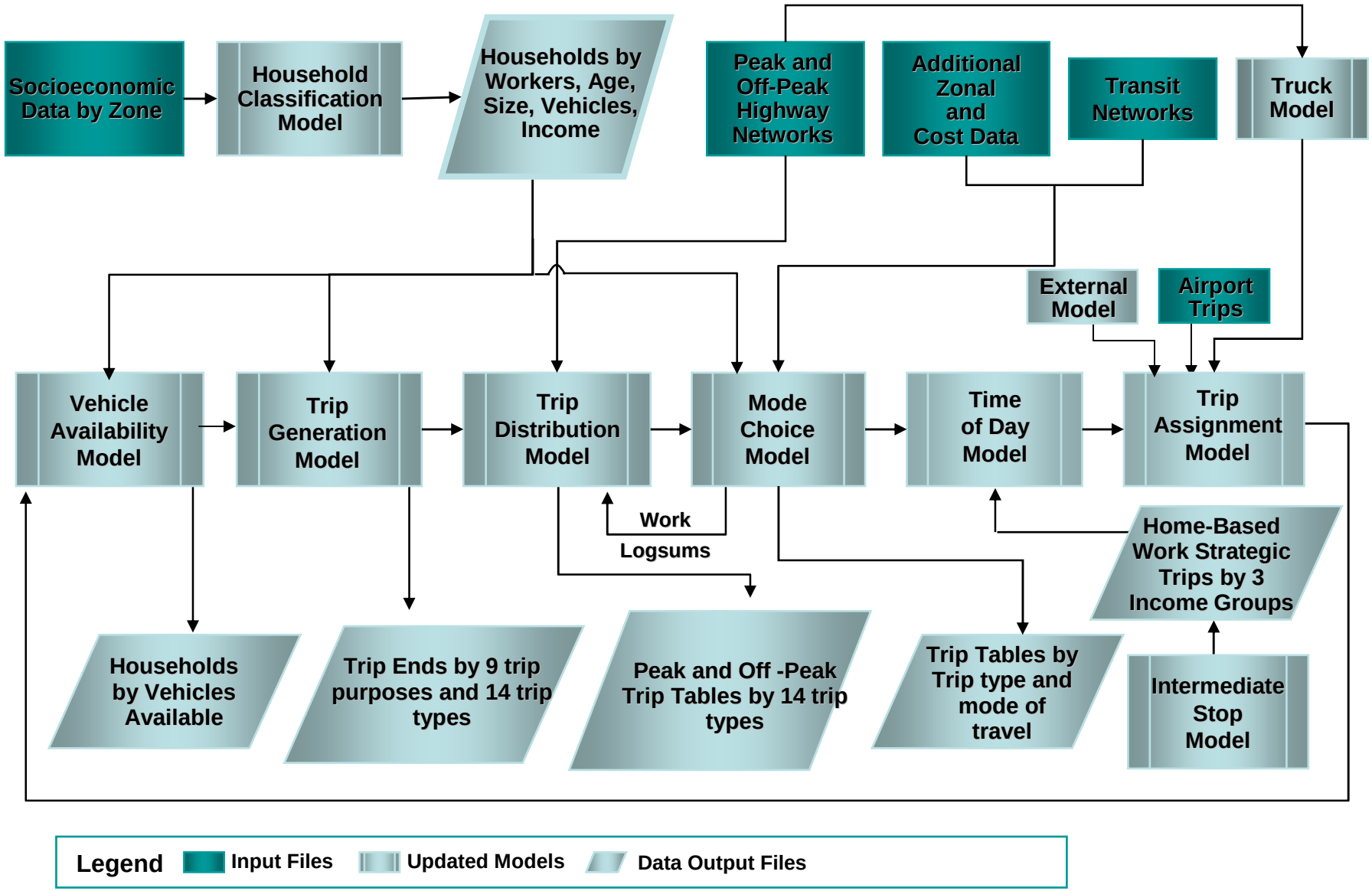
In the past, SCAG has prepared a model validation report for each of the previous planning cycle base years: 1980, 1984, 1987, 1990, 1994, 1997, and 2000. The base year of 2003 now replaces the previous base year of 2000. SCAG's new Regional Transportation Travel Demand model was used for the 2003 model validation, and will be applied during the analysis and evaluation of the Regional Transportation Plan (RTP).

The general objective of the Year 2003 Model Validation effort was to analyze the performance of the Regional Transportation Model compared to independent sources of travel data, such as traffic counts (ground counts taken along regional highways within the Region), transit ridership data, and vehicle miles traveled estimates.

TECHNICAL APPROACH

The Year 2003 Model Validation process ensures that the Regional Transportation Model accurately simulates traffic volumes and transit usage in the Year 2003. The enhancements to the transportation modeling process (see Figure 1-1) are described in greater detail in Chapters 2 through 8 of this report. Reports documenting the development and calibration of the trip generation, trip distribution, and mode choice models, as well as the Heavy-Duty Truck Model are referenced in the List of Bibliographies at the end of this report. Finally, the methods used to determine auto operating cost are presented in the appendix D to this report.

FIGURE 1-1.
SCAG REGIONAL TRAVEL MODELING PROCESS



To assure a successful model validation, two key practices were followed:

1. The most recent socioeconomic input data was used in the Year 2003 Validation. It is crucial to the success of the Regional Transportation Model to use data from the most reliable source. Socio-economic data is the first input in the transportation modeling process. Because the modeling process is sequential, each step builds upon the last. Errors in the socioeconomic data will cause cumulative errors in the modeling process. Year 2003 data was used as the primary source for the socioeconomic variables, such as residential population, group quarters population, households, household income, workers, and employment by type.

2. Several measures were applied during the development of the Year 2003 Model to insure that the validation tests are objective. It is critical that the validation tests provide objective comparisons to the "real world" conditions and that the model demonstrates strong predictive capabilities.

    - An extensive effort was conducted to collect relevant travel data. It is important to review carefully alternative data sources and to analyze trends of the data. For example, traffic counts are subject to strong seasonally variations (day of the week, month of the year, etc.), PeMS speed data is subject to the working condition of detectors and speed imputation methods, and HPMS VMT estimation is subject to the reliability of sample data.

    - Consistent methods and assumptions were used in both Year 2000 and 2003 model validation efforts. This includes comparable input data such as socioeconomic data and highway and transit network assumptions. As an example, the mode choice model is particularly sensitive to assumptions used in developing transit walk access and auto access links. Consistency between these assumptions was necessary for an unbiased and objective comparison of model results with those of prior year models.

NEW MODEL HIGHLIGHTS

Year 2003 model validation was based on SCAG's most recent Travel Demand Model (New Model). The New Model is a trip based convergence (see page 95 for a description of the convergence process) model which covers the entire SCAG Region. This model was developed on TransCAD software platform. The New Model uses an Integrated Highway and Transit Network system based on a GIS approach. It was calibrated to Year 2000 travel behavior and validated to Year 2003 travel statistics. Highlights of the New Model include the following:

Trip Generation Model

1. Detailed socioeconomic data
2. MNL vehicle availability model
3. Census household classification models

4. Cross-classification trip production models
5. Regression trip attraction models on household and NAICS employment data
6. Total person trips including non-motorized trips, stratified into14 trip types

Trip Distribution Model

1. Gamma curves of covariant impedance
2. Intermediate Stops Model for HBWS
3. Calibrated friction factors by trip purpose, income group (for work trips), and time period (peak, off-peak), 28 curves in total.
4. Logsum from mode choice used in home-based work direct trips
5. Intermediate stop choice models allocate home-based work strategic trips to intermediate stops after mode choice

Mode Choice Model

1. Nested Logit models
2. Separate models for each trip purpose, stratified by peak and off-peak periods
3. Includes non-motorized trips
4. Model transit trips by mode and access/egress types

Assignment Model

1. External Trips Model
2. Volume Delay Functions
3. 4 time period equilibrium assignments
4. 3 auto classes (SOV, HOV2, HOV3+)
5. 3 classes of heavy-duty trucks
6. External trips from external model
7. Ports trips from LA and LB ports
8. Airport trips from airport demand model
9. Simultaneous assignments with transit vehicles
10. Transit assignments by access mode

MODELING AREA

The Regional Model's study area includes Imperial County, Los Angeles County, Orange County, Ventura Counties, Riverside County, and San Bernardino County. Figure 1-2 depicts the regional modeling area.

FIGURE 1-2
SCAG MODELING STUDY AREA

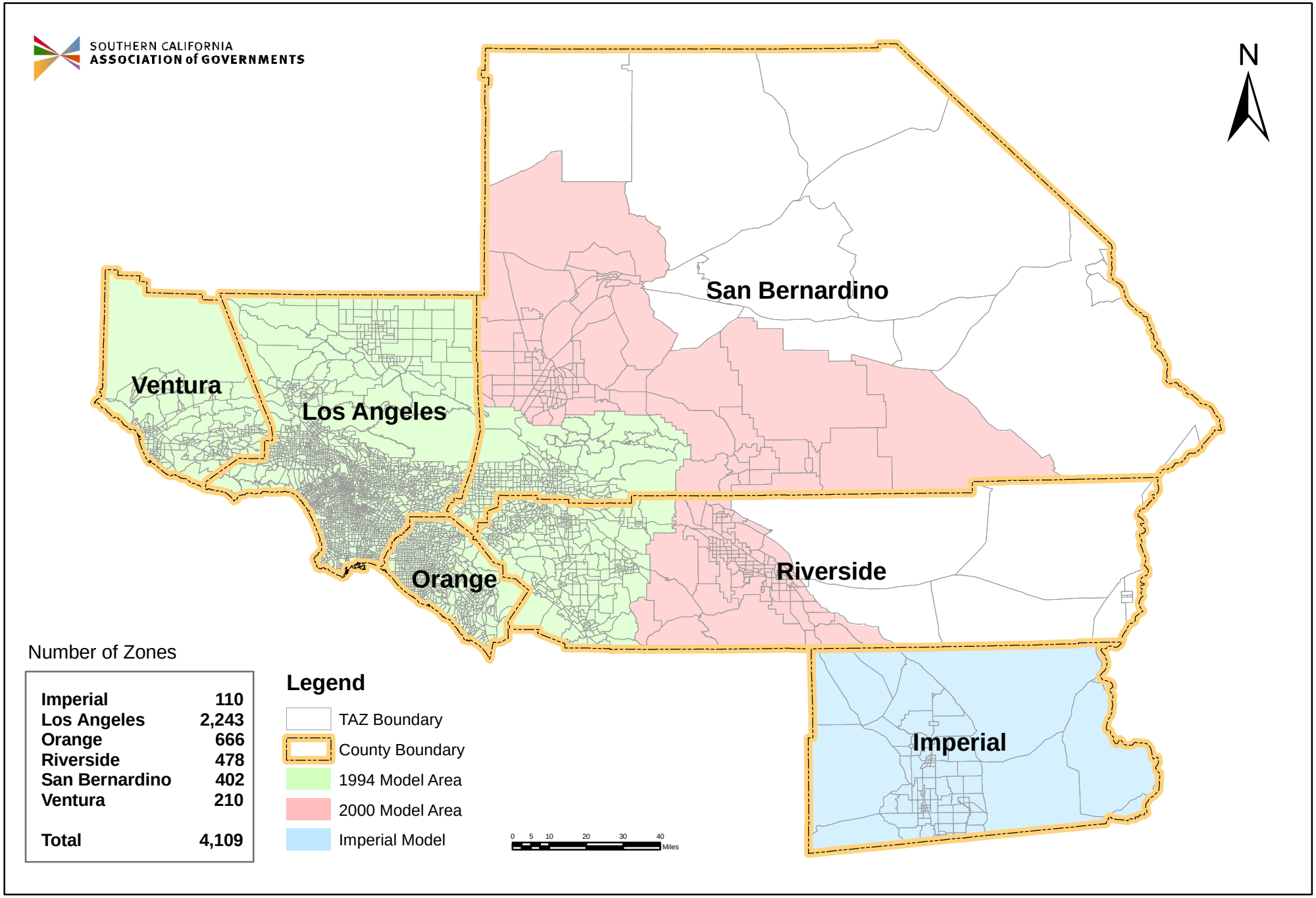


FIGURE 1-3
TRAFFIC ANALYSIS ZONE SYSTEM

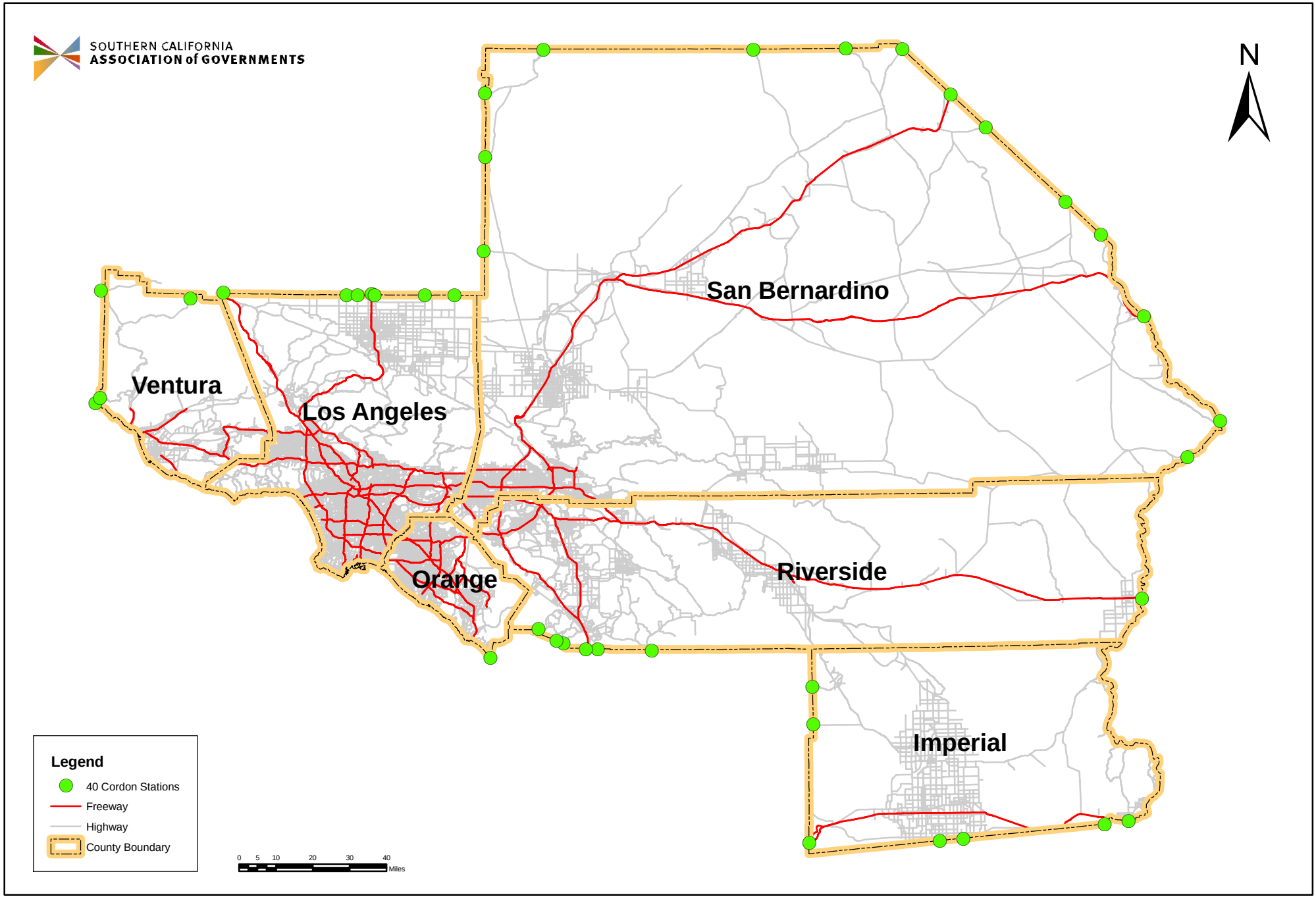


FIGURE 1-4
MODELING STUDY AREA CORDON LOCATIONS

ZONE SYSTEM

The Transportation Analysis Zones (TAZs) provide the spatial unit (or geographical area) within which travel behavior and traffic generation are estimated. Figure 1-3 provides a map of the TAZ system. The zone system includes 4,109 TAZs, 31 Port related TAZs, 12 Airport TAZs, and 40 Cordon Stations. Appendix A provides a detailed description of the methodology used to create the zone system and presents Table A-1 summarizing the zones by county.

The Regional Transportation Model uses 40 external stations (cordons) to account for external trip making. An external trip is a trip with at least one of its trip ends falling outside the modeling area. This includes the following types of trips: trips starting inside the modeling area to outside the area, trips from outside the area to inside the modeling area, and through trips which travel from one cordon to another cordon. Figure 1-4 depicts the 40 cordon stations, or points of entry and exit along streets and highways at the perimeter of the modeling area.

OVERVIEW OF REPORT

Performance of the Year 2003 Model, and key comparative statistics, are summarized in this section by major modeling component: trip generation, trip distribution, mode split, and trip assignment. Details of the various models, as well as the model inputs, are described in the following Chapters.

Chapter 1 *Overview*
Chapter 2 *Socioeconomic Data*
Chapter 3 *Trip Generation*
Chapter 4 *Transportation Networks*
Chapter 5 *Trip Distribution*
Chapter 6 *Mode Choice*
Chapter 7 *Heavy-Duty Truck Model*
Chapter 8 *Trip Assignment*
Chapter 9 *Air Quality Impact Analysis*

Additional technical details are included in Appendices A through D.

Appendix A. *The Regional Transportation Analysis Zone (TAZ) System*
Appendix B. *Regional Highway Network Coding Conventions*
Appendix C. *Specification of Trip Production Models*
Appendix D. *Auto Operating Costs*

OVERVIEW OF MODEL RESULTS

Trip Generation

The first step in the modeling process is to generate person trips by TAZ. Person trips are generated for each of the 14 trip types (9 trip purposes) based on the socioeconomic data described in Chapter 2. Results of this process include trip productions (primarily from residential land uses) and attractions (primarily related to employment) for each trip type. Details regarding the specific steps used to generate person trips are provided in Chapter 3.

Results of the trip generation model indicate that 58,089,196 person trips were generated on a typical Year 2003 weekday within the Regional modeling area depicted in Figure 1-2. It should be noted that the modeling area was expanded to include the urbanizing areas within the Region's mountain and desert areas. Table 3-5 provides summary statistics for trip generation. Table 3-5 also indicates that 11,249,349 or 19.4 percent of total daily trips in Year 2003 were home-based work trips.

Trip Distribution

Details regarding how trips were distributed are provided in Chapter 5. Before the trips can be distributed between zones, highway and transit networks must be developed. Chapter 4 provides a thorough explanation of the network coding process.

The results of the trip distribution model indicate that about 89.8 percent of the Year 2003 home-work trips generated in Los Angeles County had destinations within the County. Orange County retained approximately 79.6 percent of its Year 2003 estimated home-work trips. Ventura County retained about 74.3 percent of its home-work trips. San Bernardino County's estimated intra-county work trip percentage was 62.2 percent, while Riverside County's intra-county home-work trip percentage was 68.6.

Mode Choice

Chapter 6 provides details regarding the mode choice model. The procedures applied to estimate mode split produced 452,101 daily home-work transit trips in the expanded modeling area for Year 2003. The remaining (non-transit) home-work person trips were estimated at 9,196,505 vehicle trips. These trips were grouped considering vehicle occupancy, resulting in: 8,355,454 drive alone vehicle trips, 665,111 two-person vehicle trips, and 175,939 vehicle trips with three or more persons. Total weekday transit ridership in Year 2003 was estimated at 924,523. Total daily vehicle trips in Year 2003 resulted in an average vehicle occupancy of 1.39. The daily home-to-work average vehicle occupancy is 1.12.

Trip Assignment

Details regarding trip assignment for each mode are provided in Chapters 7 and 8. Once the highway trips were assigned to the network, the estimates were validated by comparing Average Weekday Traffic (AWT) volumes predicted by the Model, to "observed" traffic counts along the 23 regional screenlines. Screenlines are defined as imaginary lines that cross one or more freeways and/or major streets that are parallel to one another. Overall, the total model-predicted screenline volumes (across all screenlines) differed by less than 1.5 percent from the total observed daily counts along the same screenlines. On an individual screenline basis, 10 screenlines came within 5 percent of the observed counts, and 6 came within 10 percent. The remaining screenlines came within 18 percent. The Heavy-Duty Truck Model volumes across all screenlines were about 6 percent higher than observed truck counts. These screenline results were found to be within the tolerance level considered acceptable for a regional transportation model.

Results of the trip assignment process indicated there were 371,973,000 Vehicle Miles of Travel (VMT) on an average weekday in Year 2003 by light and medium duty vehicles (passenger cars, pick-ups, single unit trucks, and recreational vehicles). In addition, the Heavy-Duty Truck Model estimated 29,524,000 daily vehicle miles of travel by heavy-duty trucks within the Region. The heavy-duty truck volumes represent about 7.4 percent of the total regional vehicle mile traveled.